

AIRCRAFT CIRCULARS
NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

No. 85

THE GLOSTER "GOLDFINCH" (BRITISH)
Single-Seat Fighter

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THE GLOSTER "GOLDFINCH" (BRITISH)*

Single-Seat Fighter

The latest type of Gloster military airplane of which particulars may be published, is the "Goldfinch," a single-seat fighter fitted with the Bristol "Jupiter" Mark VII engine. Put very briefly, it may be said that the "Goldfinch" is the all-metal version of the well-known Gloster "Gamecock," of which large numbers are in use by the British Royal Air Force. There are differences other than those of construction, but the "family likeness" is unmistakable. Fitted with the Bristol "Jupiter VII," which is a direct-drive supercharged engine specially designed to give maximum power at a considerable altitude, the "Goldfinch" develops its maximum horizontal speed (172 M.P.H. = 277 km/h) at a height of about 10,000 feet (3,050 meters), but still maintains a very excellent speed at greater heights, so that even at 20,000 feet (6,100 meters) the speed is as high as 157 M.P.H. (253 km/h). The climb of the "Goldfinch" is equally excellent, as will be realized when we state that the altitude of 20,000 feet is reached in 16 min. 9 sec. If we add that the "service ceiling" (i.e., the altitude at which the rate of climb is 100 ft./min.) is 26,800 feet (8,170 meters), it will be realized that the "Goldfinch" is an airplane

*From Flight, October 4, 1928.

which, in point of performance, has few superiors. (Figs. 1, 2, and 3)

Constructional Features

Of the aerodynamic design of the "Goldfinch" little need be said here. The airplane differs hardly at all from the "Gamecock" in this respect, but the results of the Gloster company's experience in the design of racing aircraft are traceable in several details. The airplane is of the normal single-bay biplane type, employing, as have done Gloster airplanes for a number of years, a high-lift airfoil in the upper wing and a thin section airfoil in the lower. It is, however, in the constructional design that the greatest interest of the "Goldfinch" lies, since all-metal construction is now demanded by the British Air Ministry, and this is the first airplane incorporating this feature to be produced by the Gloster Aircraft Company.

Steel is the material chiefly used in the construction of the "Goldfinch," with duralumin here and there to suit local requirements. The fuselage is a steel tube structure, in which use is made, in the front portion, of square-section tube for struts as well as longerons, no wire bracing being employed in this portion (Fig. 4). The portion from aft of the pilot's cockpit to the sternpost is built as a separate unit, bolted to the front one, and is of circular-section mild steel and duralu-

min tubing, braced by tie rods. In the front portion, where the struts act both as tension and compression members, the joints between them and the longerons are flat mild steel plates bolted through struts and longerons, ferrules being inserted to prevent the flat-sided tubes from buckling when the nuts are tightened up (Fig. 5).

In the case of the rear portion, where the longerons and struts are of circular section and braced by tie rods, a different type of fitting has been used. This takes the form of a mild steel pressed plate fitting wrapped around the longeron and shaped to house the strut ends. Details are shown in Figures 6 and 7.

Of particular interest as regards the front fuselage frame is the method of accommodating the steel spars of the lower center section or wing roots. The spars of the lower wings are of high tensile steel, of the section shown in Figure 5. This type of spar starts life, so to speak, as a circular section tube, and is then rolled to the "triple-barrel shot gun." At the points where the spars are attached to the struts and longerons a duralumin packing block is inserted, this block being machined to fit inside the spar section, as shown in Figure 5.

The rectangular-section main structure of the fuselage is faired to a rounded section, the front fairing being of aluminum, while in the rear portion the formers are of wood.

Like the fuselage, the wings are of all-metal construction, with steel as the chief material. Reference has already been made to the form which the lower spars take. The top spars, also of high tensile steel, are of a different construction, with rolled top and bottom flanges of strip steel, diagonal bracing being used between top and bottom flanges. A false spar carries the narrow-chord ailerons.

The ribs, which are also of high tensile steel strip, are built up in the form of a Warren girder, with the top and bottom flanges and diagonal web members rolled to a trough section. There is, however, this difference that whereas in the flanges the edges are turned outwards, in the diagonal web members they are turned inwards. The web members are attached to the flanges by riveting.

The Bristol "Jupiter" Mark VII engine is mounted on a mild steel ring rigidly supported on struts which allow easy access to the engine, magnetos, etc. In the side elevation (Fig. 4) the arrangement of the engine mounting may be seen. In accordance with usual Gloster practice, the two gasoline tanks are housed in the top wings, with direct gravity feed to the engine. The oil tank forms a cooler, and is let into the deck fairing behind the engine.

The stabilizer, elevator, fin, and rudder are also of steel construction, partly mild steel and partly high-tensile steel.

The stabilizer is arranged for trimming, being pivoted around its front spar, by means of a square-thread worm, sprocket wheel and cable.

The landing gear, which is of wide track, is of the type in which the load is taken on rubber blocks working in compression, plates being interposed between adjacent blocks. Bouncing is prevented by an oil-damping device.

The pilot's seat is of the adjustable type, being raised and lowered by the movement of a lever. The weight of the pilot is taken by elastic shock absorbers, thus facilitating the raising of the seat while in flight.

Equipment

The "Goldfinch" is provided with a very full equipment, including wireless, parachute, two machine guns, ammunition, oxygen apparatus, and electrical equipment, as well as all the usual navigation and engine instruments. Owing to its relatively low landing speed (under 60 M.P.H.) and wide wheel track, the "Goldfinch" might well be used as a night fighter. In that case, an exhaust ring is fitted. The installation of the two generators (wireless and lighting and heating) is unusual in that they are built into the top center section, thus giving a minimum of drag.

Flying Qualities

Pilots who have flown the airplane report that the "Goldfinch" is very maneuverable and easy to control, and that the cockpit is well arranged, roomy, warm and comfortable, while the view is good for fighting, bombing and ground machine gunning.

Component Weights

The following details of item weights is interesting in showing how the total loaded weight of 3050 lb. (1387 kg) is made up:

Component	Weight	
	lb.	kg
Propeller	69	31.4
Engine	798	363.0
Starting magneto	8	3.635
Piping	15	6.82
Exhaust pipes	10	4.55
Top wings	253	115.0
Fuel and tanks	503	229.0
Struts and wires	53	24.1
Oil and tank	67	30.45
C. C. gear	17	7.73
Electrical equipment	22	10.0
Instruments	19	8.64
Bottom wings	157	71.4

Component	Weight	
	lb.	kg
Guns and mountings	67	30.45
Ammunition	97	44.1
Controls	35	15.9
Pilot	180	81.8
Seat and parachute	34	15.45
Very pistol	7	3.18
Oxygen apparatus	5	2.27
Wireless equipment	25	11.35
Tail	44	20.0
Bottom fin	7	3.18
Top fin	10	4.55
Rudder	10	4.55
Skid	9	4.09
Landing gear	115	52.3
Sights	4	1.82
Fuselage and equipment	410	186.3
Total loaded weight	3050	1387.0

Performance

		min.	sec.
Climb to	5,000 ft. (1,525 m)	3	18
" "	10,000 " (3,050 ")	6	30
" "	15,000 " (4,570 ")	10	21
" "	20,000 " (6,100 ")	16	9
" "	25,000 " (7,620 ")	28	0
Absolute ceiling		28,000 ft.	(8,539 m)
Service "		26,800 "	(8,170 ")
Speed at	10,000 ft. (3,050 m)	172 M.P.H.	(277 km/h)
" "	15,000 " (4,570 ")	167 "	(269 ")
" "	20,000 " (6,100 ")	157 "	(253 ")
Landing speed		59 "	(95 ")

Characteristics

Span	30 ft. 0 in.
Height	10 " 8 "
Length	22 " 3 "
Areas: Wings	274.3 sq.ft.
Ailerons	30.0 "
Stabilizer	19.2 "
Elevators	12.2 "
Fins	8.0 "
Rudder	8.3 "

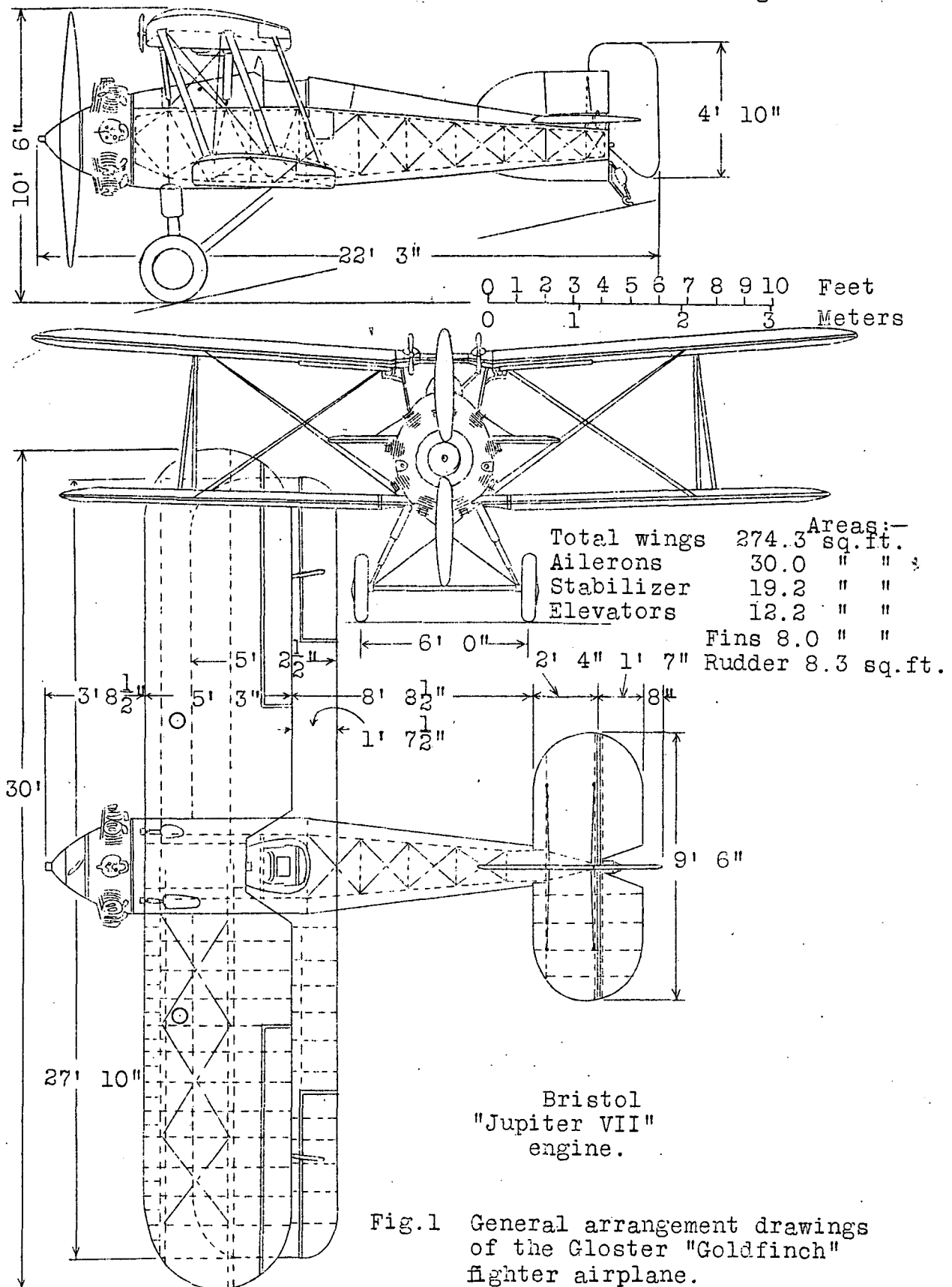


Fig.1 General arrangement drawings of the Gloster "Goldfinch" fighter airplane.



Figs.2,3 Views of the Gloster "Goldfinch" airplane. Note the neat cowl-
ing of the Bristol Jupiter VII engine.

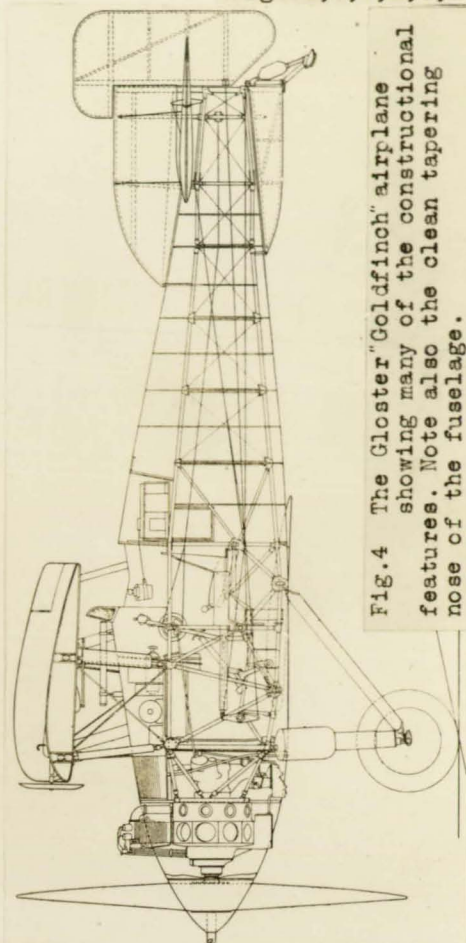
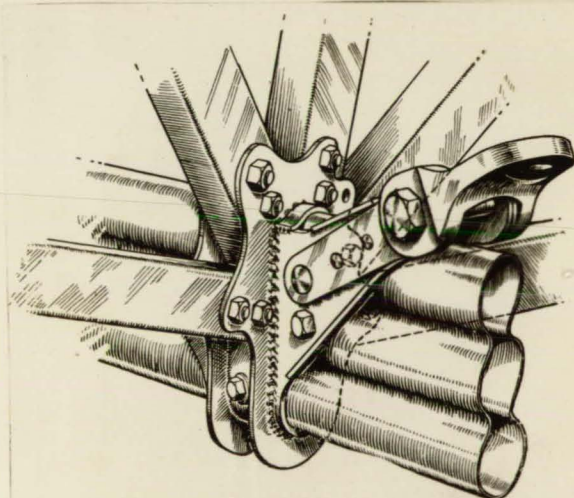


Fig.4 The Gloster "Goldfinch" airplane showing many of the constructional features. Note also the clean tapering nose of the fuselage.

Views
and
sketches

taken from "Flight" Oct. 4, 1928



Goldfinch

Fig.5 The sketch on the left shows the form of metal construction in the front of the fuselage, and the method of securing the rolled-steel spar. The packing block shown on the right is of duralumin.

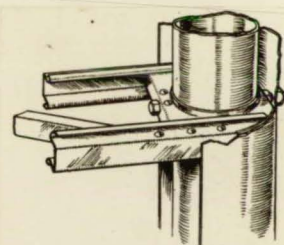
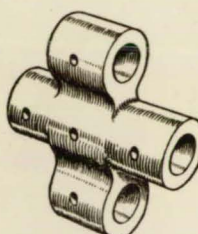


Fig.6 Rudder construction.

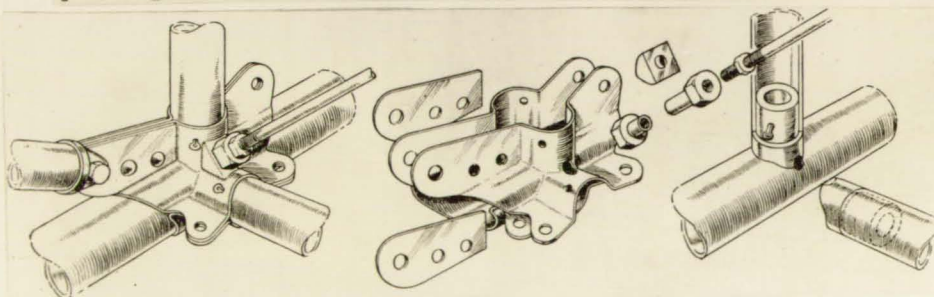


Fig.7 Sketches illustrating the form of construction in the rear portion of the fuselage.